Plant Archives Vol. 25, No. 1, 2025 pp. 2539-2542 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.no.1.367

REGULATION OF SUMMER SEASON FLOWERING TO ENHANCE THE QUALITY PARAMETERS OF MRIG BAHAR IN GUAVA (*PSIDIUM GUAJAVA* L.) CV. LUCKNOW-49 UNDER SODIC SOIL

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(Date of Receiving-03-02-2025; Date of Acceptance-05-04-2025)

ABSTRACT

The present investigation entitled "Regulation of summer season flowering to enhance the quality parameters of mrig bahar in guava (Psidium guajava L.) cv. Lucknow-49 under sodic soil" was conducted at Production Processing of Usar Waste Land Akma, Department of Fruit Science, Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Ayodhya (U.P.) during 2021-22. The experiment was conducted in a Randomized Block Design with three replications and ten treatments. The treatments were Urea (15, 20 and 25%), NAA (75, 150 and 225 ppm), 2,4-D (20, 40 and 60 ppm) and control applied on second week of April. Among the treatments, deblossoming with NAA 225 ppm showed maximum TSS and maximum reduction in acidity over the control in winter season as well as in rainy season crop. With regard to fruit quality parameters, 2,4-D 60 ppm induced maximum increase in Vitamin C (250 mg/100 gm), reducing sugar (4.55%), non-reducing sugar (2.61%) and total sugars (7.16%) over control in winter season as well as in rainy season crop.

***Key words*:** Guava, Deblossoming, NAA, 2,4-D, Vitamin C, TSS, Acidity.

Introduction

Guava (*Psidium guajava* L.) is a very popular fruit of India and it is also called the 'Apple of tropics. In India, guava is one of the most significant tropical and subtropical fruit crops. It is a member of the "Myrtaceae" family and chromosome no is 2n=22. It is originated from Tropical America, stretching from Maxico to Peru (Radha and Mathew, 2007). In recent years, guava cultivation has gained popularity due to increasing international trade, nutritional contents and value-added products of guava.

India is one of the most important countries as far as production and consumption of guava in the world. In India guava is widely grown in Uttar Pradesh, Madhya Pradesh, Bihar, Andhra Pradesh, West Bengal, Chhattisgarh, Punjab, Gujarat, Tamil Nadu, and Karnataka. The best quality guavas are produced in Uttar Pradesh. The guavas which are produced in Allahabad district of Uttar Pradesh are best in the world (Chadha, 2007). Guava is 5th popular fruit in India after Mango, Banana, Citrus and Papaya. Total area under guava cultivation is 2.76 lakh hectares with annual production of 42.53 lakh ton (Anonymous 2018-19). Uttar Pradesh has largest area covering about 49.53 thousand hectares followed by Madhya Pradesh 35.08 thousand hectares, Bihar 27.61 thousand ha. and Chhattisgarh 21.89 thousand ha. Uttar Pradesh produced 9.28 lakh ton guava annually, followed by Madhya Pradesh 6.86 lakh ton, Bihar 4.27 lakh ton, and West Bengal 2.15 lakh ton (Anonymous 2017-18).

Guava fruits often called poor man's apple. It is easily available with reasonable price thus also named as Apple of Tropics and Super Fruit for its nutraceutical values

(Nimisha *et al.*, 2013). It is a good source of vitamin C (210-305 mg/100g. of pulp). It's fruit also contains 0.33% acidity, 4.46% reducing sugar, 7.87% total sugar, 1.11% starch, 0.5-1.8% pectin, 13.29% total soluble solids, phosphorus 22.5-40 mg, calcium 10-30 mg and iron 0.60-1.39 mg. Guava is third richest source of Vitamin C (299 mg/100g) after Barbados cherry (1000-4000 mg/100g pulp) and Aonla (600 mg/100g of pulp) (Gupta, 2018).

The most popular cultivars of guava are Lucknow-49 (Sardar guava), Allahabad Safeda, Allahabad Surkha, Hafshi, Harijha, Chittidar, Dhareedar, Banarasi, Apple colour, Red fleshed, Behat coconut, Saharanpur seedless, Nagpur seedless, Hissar Surekha, Allahabad Round, Sangam, Arka Mridula, Arka Amulya, Arka Kiran, Arka Rashmi, Safed jam, Kohir Safed, Safed Kohir, Pant Prabhat, Dholka Supreme, Nasik, Supreme mild fleshed, TRY (G)-1, Hybrid-16-1, CISH-G-1, CISH- G-2, CISH-G-3(Lalit), CISH-G-4 (Swetha), CISH-G-5, CISH-G-6, HAPSI-16, HAPSI-35 and HAPSI-46.

Crop regulation is a technique used in guava to improve winter season's crop and provide high-quality fruit with a high market value. Practice of taking winter season crop instead of rainy season crop is known as Crop regulation. In guava, flowering is more in summer season (Ambe Bahar) due to the break of winter stress that leads to more fruit production in rainy season. But, in this season due to high temperature and rainfall during fruit maturation, the duration of maturation is reduced to 30 days causes glut in the market, where as winter season fruit (Mrig Bahar) superior in quality, free from diseases and pest, which fetches comparatively higher price in the market. Winter season crop has better storage life and thus can be transported to destination offering remunerative prices (Nautiyal *et al.*, 2016). However, the production is surplus in rainy season. It offers poor quality due to insipid in test and invasion of pest in compression to winter crop on the opposite, in winter season high quality fruits are produced with good quality and fetch high monetary return (Singh *et al.*, 2000).

Materials and Methods

The present investigation titled "Regulation of summer season flowering to enhance the quality parameters of mrig bahar in guava (*Psidium guajava* L.) cv. Lucknow-49 under sodic soil" was carried out at Production Processing of Usar Waste Land, Akma, Department of Fruit Science, College of Horticulture & Forestry, Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar, Kumarganj, Ayodhya 224229 Uttar Pradesh during the year 2021-22. Twenty years old guava plants cv. L-49, were planted at 6m x 6m apart, taken for present investigation. Other orchard management practices were followed as per recommended package and practices for guava. The experiment was conducted in a Randomized Block Design with three replications. The experiment consists of 10 treatments including control. T_1 = Control (Water spray), T_2=Urea 15%, T_3=Urea 20%, T_4=Urea 25%, T_5=NAA 75 ppm, T_6 =NAA 150 ppm, T_7=NAA 225 ppm, T_8 =2,4-D 20 PPM, T_9 =2,4-D 40 PPM and T_{10}=2,4-D 60 PPM were used. Spraying was done in Second week of April. The observations recorded as Quality characters viz. TSS (^{0}Brix), Acidity (%), Ascorbic acid (mg/100 gm), Reducing sugar (%), Non reducing sugar (%) and Total sugars (%).

Results and Discussion

Quality Characters

T.S.S (^{0}Brix):

The data shows that total soluble solids of fruits were higher in winter season as compared to rainy season fruits in all the treatments. In rainy season crop, plants sprayed with NAA 225 ppm recorded maximum TSS (12.0 ^{0}Brix), followed by 2,4-D 60 ppm (11.60 ^{0}Brix) while minimum in plants sprayed with only was (control). The average TSS ranged from 9.60 to 12.0 ^{0}Brix among various treatments. During both season, treatments effects non-significantly on TSS in rainy as well as winter season crop.

In winter season, the mean values of total soluble solids ranged from 10.43 to 13.70 ^{0}Brix. In case of winter season crop, maximum TSS was recorded with spraying of NAA 225 ppm (13.70), while minimum TSS was recorded in control (10.43). While comparing both the seasons, during winter season TSS was more as compared to rainy season crop which may be attributed due to accumulation of more photosynthesis in winter season. The results are in confirmation with Kher *et al.*, (2005), Das *et al.*, (2007), Singh *et al.*, (2017), Agnihotri *et al.*, (2016), Bashir *et al.*, (2019) in guava and Rimpika (2016) in nectarine fruit.

Acidity (%):

The data reveals that the mean acidity ranged from 0.28 to 0.41 and 0.32 to 0.51 in rainy and winter season crop, respectively. Acidity content in guava fruit was significantly influenced by the different treatments. Acidity % in guava, shows decreasing trend with rising concentration of Urea, NAA and 2,4-D. However Maximum acidity was recorded in control (0.41%) which was followed by NAA 75 ppm (0.38%) and minimum (0.28%) was recorded in NAA 225 ppm followed by 2,4- D 60 ppm during rainy season. While in winter season maximum acidity was recorded in control (0.51%) which was followed by NAA 75 ppm and minimum was recorded in NAA 225 ppm (0.32%). It was found that

Table 1: Effect of Urea, NAA and 2,4-D on quality parameters in rainy season and winter season crops of Guava (*Psidium guajava* L.) cv. Lucknow-49.

Sym-bol	Treat-ments	TSS		A(%)		AC		RS(%)		NRS		TS	
		RS	WS	RS	WS	RS	WS	RS	WS	RS	WS	RS	WS
T_1	Control (Water spray)	9.60	10.43	0.41	0.51	150.81	186.67	3.40	3.61	2.25	2.48	5.65	6.09
T_2	Urea 15%	11.50	12.67	0.37	0.42	164.68	200.00	3.80	4.03	2.30	2.53	6.10	6.56
T_3	Urea 20%	10.80	12.00	0.35	0.38	168.97	213.33	3.92	4.20	2.33	2.55	6.25	6.75
T_4	Urea 25%	10.40	11.97	0.34	0.36	190.59	213.30	4.08	4.40	2.27	2.47	6.35	6.87
T_5	NAA 75 ppm	10.60	11.83	0.38	0.47	185.97	226.67	3.75	4.18	2.34	2.56	6.09	6.74
T_6	NAA 150 ppm	10.90	12.23	0.33	0.36	198.77	240.00	3.95	4.33	2.38	2.59	6.33	6.93
T_7	NAA 225 ppm	12.00	13.70	0.28	0.32	194.20	246.67	4.15	4.51	2.41	2.60	6.56	7.11
T_8	2,4-D 20 ppm	10.90	12.07	0.34	0.37	182.43	216.67	3.65	4.09	2.35	2.47	6.00	6.48
T_9	2,4-D 40 ppm	11.30	12.33	0.32	0.34	192.15	233.33	4.05	4.50	2.36	2.50	6.41	7.00
T_{10}	2,4-D 60 ppm	11.60	13.00	0.30	0.33	200.41	250.00	4.20	4.55	2.44	2.61	6.64	7.16
	SE(m) ±	**0.64**	**0.66**	**0.02**	**0.02**	**2.92**	**6.35**	**0.05**	**0.12**	**0.04**	**0.04**	**0.07**	**0.11**
	C.D. at 5%	**NS**	**NS**	**0.06**	**0.06**	**8.68**	**18.88**	**0.16**	**0.34**	**NS**	**NS**	**0.21**	**0.33**

RS: Rainy Season; **WS:** Winter Season; **TSS:** Total Soluble Solids (^{0}Brix); **A(%):** Acidity (%);
AC: Ascorbic acid (mg/100 gm); **RS (%):** Reducing sugars (%); **NRS:** Non reducing sugar (%); **TS:** Total sugars (%)

the acidity of winter season fruit was more as compared to rainy season fruits. The lowest acidity might be due to early ripening of fruits caused by the treatment, where acid might have been used during respiration or instantly converted into sugars. Similar results were obtained by Gurjar *et al.,* (2018), Hiremath *et al*., (2018), Kaur and Kaur (2017), Maji *et al*., (2015), Agnihotri *et al*., (2013), Dubey *et al.,* (2002), Dhaliwal and Kaur (2003), Singh and Dhaliwal (2004), Singh *et al*., (1992) in guava fruit and Rimpika in nectarine fruit.

Ascorbic acid (mg/100 g of fruit pulp)

It shows that the mean Vitamin C content of fruits among the different treatment varies from 150.81 to 200.41 mg and 186.67 to 250.00 mg in rainy and winter season, respectively. It was found that ascorbic acid content of winter season fruits is higher than rainy season fruits.

Vitamin C content was higher in fruits during both summer and winter season of the trees which were treated with 2,4-D 60 ppm, while trees which were left untreated had least Vitamin C content. The maximum ascorbic acid content might be due to high leaf ratio and high photosynthesis activity. The results are cognizance with the finding of Kundu and Mitra (1997) in guava fruit.

Reducing sugars (%)

All the treatments significantly increased reducing sugar over control in rainy and winter season crop. In rainy season, maximum reducing sugar (4.20%) was noticed with foliar spray of 60 ppm 2,4-D while minimum (3.40%) in control.

In winter season, maximum (4.55%) reducing sugar was obtained with foliar spray of 2,4-D 60 ppm followed by 225 ppm NAA, whereas minimum (3.61%) in control. This may be due to quick metabolic transformation of starch into soluble sugars and early ripening in response to growth substances. Similar observations were recorded by Agnihotri *et al*., (2013), Kaur and Kaur (2017) and Mitra *et al*., (1982) in guava fruits and Nawaz *et al.,* (2008) in kinnow mandarin fruit.

Non reducing sugar (%)

In rainy season crop, plants sprayed with 2,4-D 60 ppm recorded maximum non-reducing sugar (2.44%), followed by NAA 225 ppm, while minimum (2.25%) in plants sprayed with only water (control). Among the treatments, non-reducing sugar of fruits found non-significant with respect to concentrations of treatments in both rainy and winter season.

In winter season, the mean values of non-reducing sugar ranged from 2.48 to 2.61%. In case of winter season crop, maximum non-reducing sugar (2.61%) was obtained with spraying of 60 ppm 2,4-D and was at par with 225 ppm NAA, while minimum non reducing sugar was recorded in untreated plants (2.48). Similar observation was recorded by Agnihotri *et al*. (2013), Kaur and Kaur (2017), Mitra *et al.,* (1982) in guava fruits and Nawaz *et al.,* (2008) in kinnow mandarin fruits.

Total sugars (%)

All the treatments significantly increased totals sugars over control. Total sugars increased with increasing concentration of Urea, NAA and 2,4-D in rainy and winter season of fruits. In rainy season, maximum total sugars

(6.64%) were found with foliar spray of 2,4-D 60 ppm followed by NAA 225 ppm (6.56%) while minimum (5.65%) under control. In winter season, the mean values of total sugars ranged from 6.09 to 7.16%. In winter season maximum total sugars (7.16%) was recorded with 60 ppm of 2,4-D which was followed by NAA 225 ppm and minimum value (6.09%) was obtained in control. The maximum total sugar might be probably due to higher leaf to fruit ratio because of restricted number of fruits harvested and high photosynthesis activity or this may be due to quick metabolic transformation of starch into sugar and early ripening. Similar effects of different treatments have been also reported by Kundu and Mitra (1997), Mitra *et al.*, (1982), Agnihotri *et al.*, (2013), Kaur and Kaur (2017) in guava fruit and Nawaz *et al.*, (2008) in kinnow mandarin fruits.

Conclusion

The investigation showed that spray of different chemicals was effective to regulate flowering by deblossoming of summer season and to produce more and quality fruiting in winter season. The fruits of winter season were significantly superior in all qualities than the fruits of rainy season. So, it can be concluded that summer deblossoming with NAA @ 225 ppm might be the much effective crop regulating treatment followed by 2,4-D @ 60 ppm to get better quality fruits of guava cv. L-49 (Sardar guava) also more profit from winter season.

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